

the trigger-guard, moved the trigger. This pneumatic method was employed by the authors of the paper because it introduced no vibration when acting, and the method is strongly emphasised by the writers, who apparently have overlooked the fact that an exactly similar method has been in use in England for the last seven years in connection with the Tram chronograph used in ballistic work. Since the pneumatic method of firing introduces no vibration, it could be used in connection with a gun slung by ropes.

An attempt is made to show nodal points of vibration by means of sand figures, after the manner of Chladni, and sand curves were produced on a surface attached by cement to the guns when clamped and also when supported loosely, and also in the case of a barrel used without a stock. The vibrations appeared to be approximately the same in each case. The research concludes with a list of results, and it is stated that in the case of the 6 mm. gun the exit of the shot takes place just before the completion of the first quarter vibration of the first appearing second over tone. The research, although presented in a form almost too much condensed in parts to be quite clear, is of considerable interest, and has evidently been conducted with care and patience.

I wish to take this opportunity of acknowledging the kind assistance given me by Mrs. Max Schiller in connection with some portions of the authors' work on ballistics. F. J.-S.

#### THE ROYAL INDIAN ENGINEERING COLLEGE.

IT is evident from the letters and comments which have appeared in the *Times* and other papers, that the summary notice of dismissal of a large part of the scientific staff of the Royal Indian Engineering College, Coopers Hill, is regarded as an act of injustice which, if permitted to take effect, would be distinctly detrimental to the interests of science. The facts of the case were stated in these columns last week, and an examination of them is sufficient to convince any one that the seven gentlemen who have received notice that their services will not be required after the end of the Easter term have been treated with little courtesy and no consideration. That it should be possible for men of scientific eminence to be dismissed from their posts more easily than if they were civil service messengers or clerks, is one of the many indications we have of the small value attached by the official mind to scientific work and distinction. Perhaps Lord Kelvin's letter, which we reprint below from the *Times*, will show that the matter is not to be permitted to rest in its present unsatisfactory position.

SIR,—The correspondence which appeared in the *Times* of January 3 regarding Coopers Hill College has caused a painful shock to all who know of the good work which the college has done in giving to India the benefits of well-trained engineers in the service of its Government. No one can read that correspondence, I believe, without being convinced that the seven professors and teachers whose position is threatened are justified in asking for an inquiry.

The proposed action—a sudden and arbitrary dismissal of able and distinguished scientific teachers who have been doing duty for periods of nine to thirty years in a satisfactory manner—is certainly not to be expected in institutions under the control of the British Government; and I sincerely hope that the Secretary of State for India in Council will see his way to granting the request for an inquiry.

I am your obedient servant,

KELVIN.

Netherhall, Largs, Ayrshire, January 11.

The principle of the action is as bad as the private injury, for it suggests that gentlemen of education and distinction, who have held Government posts for long periods, may have their services dispensed with at the

will of a military officer having no special qualifications to enable him to know the value of their work. If there is no more security of tenure for scientific men than is implied in the act of the president of the College at Coopers Hill, it is because they have not asserted their rights with sufficient insistence, and the sooner they do so the better it will be for their positions. Opportunity for showing that the gentlemen who have been instructed to give up their appointments at Coopers Hill have the world of science behind them will be afforded by a memorial in their favour which we hear is being prepared, to be submitted to the Secretary of State for India.

No excuse worthy of consideration has been offered for the dismissal of half the educational staff of the College. The salaries of the gentlemen who have received notice—for that is what it amounts to—are by no means too liberal, so that the statement that the action has been taken with a view of reducing expenses seems altogether insufficient. As "M. A." shows in the *Times*, money is available for the needs of the College, and "it is the worst form of economy to starve the staff of a teaching institution." Another writer goes even further, for he asks, "Is it not the case that the college has been for some years self-supported by fees from students?" But, putting this question aside, we have no hesitation in saying that the work done by the gentlemen dismissed could not be carried on with the present efficiency at less cost. In any case, the method adopted is not the one best calculated to improve the efficiency of any institution.

There is one other point, and it is not the least important. Assuming that the president of the College is able to dismiss arbitrarily as many members of the staff as he cares to dispense with, then some substantial compensation should be given to those thus compulsorily retired. Dr. Johnstone Stoney mentions in the *Times* that "when, twenty-one years ago, the Government through Parliament gave Ireland an Examining Board in place of a University, it allotted when doing so the full amounts of their salaries or emoluments as compensation for loss of office to the outgoing members of the staff of the late Queen's University and to those professors of the University who were required by their statutes to discharge University as well as college duties." This principle should be brought to the front and urged upon all who have the control of institutions like that at Coopers Hill, namely, that adequate compensation for loss of office must be awarded to the members of the staff who have to retire after years of good service.

#### NOTES.

SIR ARCHIBALD GEIKIE will shortly retire from his post of Director-General of the Geological Survey of the United Kingdom. He will be entertained by his friends at a complimentary dinner early in March. All who wish to attend should communicate with Mr. F. W. Rudler, Museum of Practical Geology, 28, Jermyn Street, London, S.W.

THE death is announced, at seventy-eight years of age, of Prof. Hermite, the eminent French mathematician. He was a member of the Academy of Sciences and a Foreign Member of the Royal Society. Announcement is also made of the death of M. Chatin, the botanist, and a member of the Paris Academy of Sciences.

THE Geological Society will this year award its medals and funds as follows:—The Wollaston medal to Mr. Charles Barrois, of Lille; the Murchison medal to Mr. A. J. Jukes-Browne, of Torquay; the Lyell medal to Dr. R. H. Traquair, of Edinburgh; and the Bigsby medal to Mr. G. W. Lamplugh, of the Geological Survey. The Wollaston fund goes to Dr. A. W. Rowe, the Murchison fund to Mr. T. S. Hall (Melbourne), and the Lyell fund to Dr. J. W. Evans and Mr. A. McHenry.

THE Council of the Manchester Literary and Philosophical Society have awarded the Wilde Medal for 1901 to Dr. Elias Metchnikoff, of the Institut Pasteur, Paris, for his researches in comparative embryology, comparative anatomy, and the study of inflammation and phagocytosis; and the Wilde premium to Mr. Thomas Thorp, for his paper on grating films and their application to colour photography, and other communications made to the Society. The Dalton Medal for 1901 has not been awarded. The presentation of the Wilde medal and premium will take place on February 5, when Dr. Metchnikoff will deliver the Wilde Lecture on "La Flore microbienne du Corps humain."

IN connection with the dispute between the Kew Observatory and the London United Tramways Company, it was mentioned in a note in our last issue that the double trolley system was in successful operation in America. The tramways referred to are at Cincinnati, and they were originally compelled to adopt this system by the Telephone Company, which successfully opposed their allowing waste current to leak into the earth. Over two hundred miles of track are thus equipped, and the managers find, after ten years running, that the cost of maintenance is considerably reduced in consequence. This seems in itself a sufficient answer to the London United Tramways Company, who urge that it is impossible to adopt the double trolley system. It is interesting to note that the advocates of earth returns are not in agreement amongst themselves. On the one hand, the London United Tramways Company claims that there is already a potential difference between their rails and earth, greater than the maximum accepted by Kew, due to leakage currents from the Central London Railway. On the other hand, the *Electrician*, in a note in the issue of January 11, maintains that the return current in a deep level railway cannot escape from the tunnel and rise to the surface in sufficient quantity to be observable by any but a mathematician. We are afraid the engineers of the Tramways Company will not regard this as a very welcome contribution to their side of the argument.

THE twenty-eighth annual dinner of old students of the Royal School of Mines will be held at the Hotel Cecil on Wednesday, February 6. The chair will be taken by Sir G. Stokes, senior past professor of the Royal School of Mines, and Sir W. Roberts-Austen will act as vice-chairman. In view of the fact that this year is the jubilee year of the School, it is expected that a large number of old students, as well as past and present professors, will be present at the dinner.

THE president of the Röntgen Society has placed at the disposal of the Council a gold medal to be awarded to the maker of the best practical X-ray tube for both photographic and screen work. The competition is open to makers in any country. Tubes intended for competition must be sent in addressed to the Röntgen Society, 20 Hanover Square, London, W. The package should contain the full name and address of the sender, and must reach the Society not later than May 1.

THE Turin Académie royale des Sciences announces that a Prix Bressa of 9600 francs (384*l.*) is open to competition among investigators and inventors of all nationalities. The prize will be awarded to the person who, in the opinion of the Academy, made the most brilliant or useful discovery in the four years 1897-1900, or who produced the most celebrated work in pure or applied science. Works intended for consideration in connection with the prize must be sent to the President of the Academy before the end of next year. The right is reserved to award the prize to an investigator whose work is considered to be the most distinguished, even though he does not submit an account of it.

THE Rome correspondent of the *Times* states that under the auspices of the Italian Geographical Society, and in the presence of the King and Queen of Italy, the members of the Royal Family, the Diplomatic Corps, the Ministry, and an audience composed of the principal personages of Roman society, his Royal Highness the Duke of the Abruzzi delivered a lecture on Monday upon his Polar expedition, in the great hall of the Collegio Romano. Captain Cagni, who commanded the sledge party, then succeeded the Duke of the Abruzzi at the desk, and related the story of the dangers and difficulties successfully overcome in planting the Italian colours furthest north at 86° 33' north latitude.

A ROYAL Commission has been appointed to make investigations respecting the beer-poisoning epidemic. The Commissioners are:—Lord Kelvin, Sir W. Hart Dyke, Sir W. S. Church, president of the Royal College of Physicians, Prof. T. E. Thorpe, Mr. H. Cosmo Bonsor, and Dr. B. A. Witlegge. Dr. G. S. Buchanan, one of the medical inspectors of the Local Government Board, is the secretary to the Commission. The instructions to the Commissioners are:—To ascertain with respect to England and Wales (1) The amount of recent exceptional sickness and death attributable to poisoning by arsenic; (2) Whether such exceptional sickness and death have been due to arsenic in beer or in other articles of food or drink, and, if so, (a) To what extent; (b) By what ingredients or in what manner the arsenic was conveyed; and (c) In what way any such ingredients became arsenicated; and (3) If it is found that exceptional sickness and death have been due to arsenic in beer or in other articles of food or drink, by what safeguards the introduction of arsenic therein can be prevented.

IT is to the credit of the members of the medical profession at Colchester that they have decided to show how they honour the memory of Dr. William Gilbert, the famous physician to Queen Elizabeth, whose work, "De Magnete," published three hundred years ago, constitutes the bed-rock of modern knowledge of magnetism. The intention is to erect a full-length marble statue of Gilbert in a niche in the main façade of the new Town Hall at Colchester, the city in which he was born, and where his remains are buried. Already the sum of 130*l.* has been contributed by the medical men of the borough, and as the minimum amount required is only 150*l.*, it will no doubt soon be subscribed. Gilbert's work is, however, so widely known and appreciated that it is almost a pity to neglect the opportunity to make the memorial a national one. The medical men of Colchester are to be congratulated upon the initiative they have taken, but there are many other men of science who would like to see that the memorial to be erected is a worthy testimony of the regard in which Gilbert's work is held in the whole scientific world. The treasurer of the Colchester committee is Mr. Henry Laver.

A BRITISH Congress on Tuberculosis will be held in London on July 22-26, and will be opened by the Prince of Wales. There will be four sections, with presidents as follows:—I. State and Municipal, Sir Herbert Maxwell, Bart. II. Medical, including Climatology and Sanatoria, Sir R. Douglas Powell, Bart. III. Pathology, including Bacteriology, Prof. Sims Woodhead. IV. Veterinary (Tuberculosis in Animals), Sir George Brown, C.B. Every British Colony and Dependency is invited to participate by sending delegates; while the Governments of countries in Europe, Asia and America are invited to send representative men of science, and others, who will be the distinguished guests of the Congress. The information already gained, both at home and abroad, shows that consumption and other forms of tuberculosis, although preventable and controllable by intelligent precautions, still remains the direct cause of a high rate of death and sickness. In the United Kingdom

alone some 60,000 deaths are recorded annually from tuberculosis, and it is stated on good authority that at least thrice this number are constantly suffering from one form or another of the disease. The object of the forthcoming Congress is to exchange the information and experience gained throughout the world as to methods available for stamping out this disease. Papers will be read, and clinical and pathological demonstrations will be given; while the museum, which is to be a special feature of the Congress, will contain pathological and bacteriological collections, charts, models, and other exhibits. The address of the General Secretary of the Congress is 20, Hanover Square, London, W.

PROF. P. K. E. POTAIN, whose death we regretfully announced last week, at the age of seventy-five years, delivered his last lecture on clinical medicine at the Charity Hospital about six months ago. His treatises on diseases of the heart and lectures on clinical medicine are renowned both among physiologists and medical men. Referring to his death at the meeting of the Paris Academy of Sciences last week, M. Marey remarked that Prof. Potain developed the means of diagnosis, and showed how various sounds characteristic of diseases of the heart should be interpreted. Not only was he able to determine with precision any injury or morbid change in the exercise of functions of organs; he showed also that the disorders themselves revealed the interrelations between such functions, that, for instance, diseases of the liver and the kidney have echoes in the heart, and that pulmonary tuberculosis prevents the development of certain cardiac lesions. He was a master of clinical medicine, and an excellent physiologist, as well as a renowned physician. He devised an ingenious colorimetric method for testing certain substances, and his sphygmometer for the measurement of arterial pressure is still among the best. Prof. Potain was a member of the Paris Academy of Medicine, a member of the Academy of Sciences, and Commander of the Legion of Honour.

CUPELLATION is one of the most ancient of metallurgical processes, and was well known at least as early as the year 600 B.C. It was used by the Romans to extract silver from its ores in Spain and at Laurion, but it has been hitherto supposed that the hearths of their furnaces were made of comparatively non-absorbent materials, such as clay and marl, the litharge and other oxides being skimmed off or allowed to flow away in side channels. It is now shown, however, by Mr. Gowland, in a paper read before the Society of Antiquaries in May last, that a silver refinery was worked at Silchester in which argentiferous copper was cupelled on hearths made of bone-ash. Bone-ash has the property of absorbing molten litharge and some other oxides as readily as blotting-paper absorbs water, and apparently only its high cost prevented its use by the Romans in all their later cupellation furnaces. Careful examination of the remains found at Silchester convinced Mr. Gowland that the work there resembled some of the operations formerly practised in Japan, and that it is probable that it consisted in the recovery of the silver from Roman copper coins issued in the third century A.D. The metal contained 4 per cent. of silver, and was cupelled in three furnaces in succession with the aid of repeated additions of small quantities of lead.

DR. R. MINERVINI, of the University of Genoa, has published recently, in the *Zeitschrift für Hygiene*, the bacteriological investigations he has made of samples of air and water collected in mid-ocean during a trip from Genoa to New York and back. He finds more bacteria in air at sea than did Fischer in his classical investigations. Out of 42 determinations, however, 6 yielded no bacteria, whilst the highest number found in a volume of 27 litres of air was only 17. As was to be expected, he obtained the best results after heavy rain. No pathogenic

bacteria were discovered. It is unfortunate that as regards the author's water examinations his stock of apparatus did not permit of his cultivating the samples at once after collection, but compelled him to keep them from seven to ten days until he landed. This fact deprives his quantitative results of their value. The report of the German deep-sea expedition, carried out during 1898-99, is awaited with great interest. It will be remembered that the German man-of-war *Valdivia* was placed at the disposal of the members by the Government, and it visited the African coasts as well as the Indian and Antarctic Oceans, and bacteriological investigations were included in the work of the expedition.

THE contents of the Cape *Agricultural Journal* (November 22, 1900), which has just reached us, testify to the widespread interest which is being taken in scientific agriculture in Cape Colony. Among subjects dealt with are the liming of soils, selection of seeds, merinos, rhubarb and mealie culture, "raising" calves without milk, and wide *versus* narrow waggon tires. The report for 1899 of the Colonial Bacteriologist is also inserted, and in it Dr. Edington describes a method for protective inoculation against horse-sickness, which is as follows:—Animals which have passed through an attack of the disease and have recovered are inoculated at intervals with increasing doses of virulent blood taken from affected horses. After this treatment the animals are bled and the serum preserved. Blood of the highest virulence is likewise obtained, standardised against the serum and preserved. A definite amount of the virulent blood is mixed with 50 c.c. of serum and injected subcutaneously. Some days later 30 c.c. of the same serum, with the same dose of blood, is injected. At a later date the procedure is repeated with a reduced dose of serum, and fourteen days later pure virulent blood is injected. This method is said to afford a perfect and complete solution to the problem of protecting horses which have to live in unhealthy districts in South Africa, and is very similar to that devised by the Imperial Bacteriologist of India against rinderpest, as mentioned in these notes on December 13 (p. 161).

IT is to be feared that it will be a long time before the general public realises what is desirable and what undesirable in artificial lighting. The two principal desiderata are well distributed, but not necessarily very brilliant, illumination, and cheapness, which means high efficiency and consequently high intrinsic brilliancy of the source of light: two characteristics in direct antagonism. The use of some form of diffusing shade is therefore desirable, even with the present electric lamps; and it will be essential when lamps of higher efficiency come on the market, as is sure to occur before long. Mr. W. L. Smith's experiments ("A Study of Certain Shades and Globes for Electric Lights as used in Interior Illumination," *Technology Quarterly*) are a timely and very valuable contribution to our knowledge of the relative merits of various types of shade. For a shade to be satisfactory, it should soften down and distribute evenly the light of the naked lamp, whilst, at the same time, it should not absorb too great a proportion of it. Mr. Smith's experiments show that this problem is solved by very few of the shades in ordinary use. It is worthy of remark that the author finds that the Holophane shades, in which the cutting of the glass is determined on scientific instead of artistic principles, are greatly superior to all others. We have seen a Nernst lamp (which is, with the exception of the arc, the most intense form of artificial illuminant) burning in a Holophane globe, and can fully endorse Mr. Smith's remarks on the excellent manner in which these globes soften and diffuse the light. It is to be regretted that the author has not drawn more distinction between globes designed to cover the lamp and shades merely intended to be hung over it, as direct comparison of the two classes is hardly fair.



The pamphlet, short though it is, contains many suggestive results, and we await with interest the promised account of further experiments.

IN the *Physical Review*, xi. 5, Mr. W. P. Boynton gives an investigation of the form of Gibbs' thermodynamic model for a substance following Van der Waals' equation, and compares this model with that given by Maxwell.

PROF. ANTIGONO RAGGI, writing in the *Rendiconti* del R. Istituto Lombardo, xxxiii. 17, gives a summary of the works of Serafino Biffi, who died on March 27, 1899. Biffi was the author of many valuable contributions to medical and physiological science, and we are glad to learn that his collected works are shortly to be published.

A PHYSICAL theory of nerve is given by Mr. W. M. Strong in the *Journal of Physiology* (xxv. 6). The theory, which is based on the ionic theory of salt solution, assumes all nerves to consist of a semi-solid axis cylinder containing a saline substance in solution. The salt is wholly or partially ionised, so that the axis cylinder is a good electrolytic conductor. Surrounding it is a medullary sheath or outer layer formed of a relatively bad conductor. The negative ion of the salt is supposed to be of a simple nature and to move freely in the semi-solid material of the axis cylinder, while the positive ion only moves with great difficulty. The contraction of a muscle, the author supposes, is directly caused by the arrival of the negative variation at the point where the nerve terminates in the muscle.

THE tenth volume of scientific memoirs edited by Prof. H. Crew and published by the American Book Company, contains reprints of the more important treatises dealing with the "wave theory of light." Beginning with the work of Christian Huygens, the first three chapters of his "Treatise on Light" (1678) are given, describing rectilinear propagation, laws of reflection and refraction; concluding this section is a biographical sketch of the life of Huygens. Next are given three of the historical contributions of Dr. Thomas Young, on the "Theory of Light and Colours," "On the Production of Colours," and "Experiments and Calculations in Physical Optics," followed, also, by a short biographical sketch of the author. The volume is concluded by memoirs of Arago and Fresnel on the "Diffraction of Light" and "Action of Polarised Light," a biography of Fresnel, and a bibliography of the literature at present available on the subject.

WE have received a copy of a report on Hertzian waves drawn up for the recent Physical Congress at Paris by Prof. Augusto Righi, of Bologna. The report deals with the subject from two points of view; the theoretical aspect, which considers the physical identity of Hertzian waves and waves of light, and the practical aspect in connection with wireless telegraphy. Prof. Righi's paper is divided into four sections, the first containing a description of the apparatus used in connection with the production and study of Hertzian waves, the second with radio-conductors, the third with the optical properties of electrical oscillations, and the last with Hertzian telegraphy. Prof. Righi's intimate knowledge of the subject and the important part he himself is known to have played in connection with the invention of wireless telegraphy have eminently qualified him for furnishing physicists with a brief summary of the progress made in this branch of physics since it was first opened up by Hertz.

THE December number of the *Photo-Era*, the American journal of photography, contains many articles of interest. Mr. Yellot reviews the third "Philadelphia Photographic Salon," and evidently does not think very much of it, as he talks of the . . . "dreary monotony about the tier on tier of weak, fuzzy,

washed-out-looking photographs. . . ." Landscape composition is another communication worth perusing. Under the heading "Photographing the Aurora," Mr. Stiles describes and illustrates the photograph he obtained at Mount Washington. He used a Ross-Goerz six-inch lens, aperture 7/7, and isochromatic plates, and gave an exposure of 35 minutes. He writes: "What is surprising is the actinic power of the auroral light as compared with the bright moonlight on the snow. Under the aurora is a dark space, which is noted in many displays. This in earlier notes on the aurora was assumed to be dark by contrast, but the photograph shows a quite definite lower boundary."

WE have received from St. Xavier's College Observatory the monthly meteorological results for the months of January to June for the thirty-three years 1868-1900, which we are glad to see will shortly be followed for the other six months, ending December last. The observatory was established in August 1867, and is situated one and a half miles north-east of the Alipore Observatory, and is sufficiently isolated for trustworthy observations. The instruments have been compared with those at either Kew Observatory or the Government Observatory at Alipore, and the observations have been carefully taken several times daily by the fathers in charge, so that the tables form a very valuable series.

MESSRS. ELSTER AND GEITEL have sent us some further accounts of their interesting experiments on atmospheric electricity. In No. 8, vol. ii. of the *Physikalische Zeitschrift*, papers are communicated on the measurement of electrical leakage in free air, and in closed spaces. Dr. Geitel finds that with regard to the air in a closed vessel, with an initial charge of 240 volts (independently of the sign of electrification) the leakage from an insulated body amounted to about 0.4 per cent. per minute; on the second day the leakage amounted to 1.0 per cent., and on the fourth day to 1.4 per cent. After this period the leakage became slower, and gradually attained a limit of about 2 per cent. per minute. A full description is given of the apparatus employed. He also found that the leakage was not proportional to the charge of electricity, but that for charges varying from 80 to 240 volts the amount remained constant. This phenomenon was pointed out by Matteucci in 1850 (*Annales de Chimie et de Physique*, vol. xxviii.), but the observation remained practically unnoticed. Further, Dr. Geitel found that the influence of daylight, or of artificial illumination, was not perceptible on the results obtained.

THE new number of the *Abhandlungen* of the Vienna Geographical Society consists of an exhaustive paper on the cork-tree, by Eugen Müller. The botany of the cork-tree and the growth and chemical constitution of the cork are first discussed; then follow a lengthy investigation of the geographical distribution of the cork-tree, a history of the production of cork, and a statistical account of the development of the world's trade in cork.

PROF. MITZOPULOS contributes a paper on two of the most remarkable of the seismic disturbances experienced in Greece during the years 1898 and 1899, to *Petermann's Mitteilungen*. The first, the Tripolis earthquake of June 2, 1898, Prof. Mitzopoulos believes to have been caused by subterranean falls of rock. The second, or Triphylyia earthquake, occurred on January 22, 1899; its epicentrum is located in the Ionian Sea, some 35 to 40 kilometres to the west of the coast of the Peloponnesus, where the bottom goes down in terraces to depths of 2500 to 3500 metres. The epicentrum was probably about 70 kilometres below the sea-bottom.

THE greater part of the December number of the *National Geographic Magazine* is devoted to an account, by Mr. Wilbur C.

Knight, of an expedition to the fossil fields of Wyoming in July 1899. This expedition was organised by the general passenger agent of the Union Pacific Railroad, who issued invitations to every important university, college, and museum in the United States. Each institution was allowed one professor and one or two assistants, who were given free transport from Chicago to Laramie and back. About one hundred men of science joined the expedition, which collected an immense amount of valuable material, including many photographs of geographical interest, some excellent specimens of which illustrate Mr. Knight's article.

WE have received the first number (January 1, 1901) of the *Geologisches Centralblatt*, which is a new fortnightly geological review intended to give titles and brief abstracts relating to all books, papers, maps and tables that have been published on geology, including palæontology and petrography. Twenty-four numbers of thirty-two pages each will be issued yearly. All works issued since April 1, 1900, will be noticed. In the present number there are notices of 104 works, consequently we may expect about 2500 articles to be recorded during the year. We may remark that in the first volume of Whitaker's "Geological Record" for 1874, there were more than 2000 entries, while in Blake's "Annals of British Geology" for 1893 there were 730 entries. The *Geologisches Centralblatt* will not, however, take notice of articles on pure mineralogy and crystallography. It starts with a good list of supporters and contributors, amongst whom are Barrois, Choffat, Reusch, F. D. Adams, and many others, and we observe that British abstracts are furnished by Mr. C. V. Crook, of the Geological Survey Library in Jermyn Street. Abstracts appear in German, English and French. The titles of works in other languages will be translated into one of the before-mentioned languages, and appear beneath the original titles. The *Centralblatt* is divided into sections, but the authors under these sections are arranged promiscuously. The abstracts extend occasionally to a page or even two pages in length; some occupy but a single line. New species of fossils are printed in distinct type, and other species specially referred to are in different type. The work cannot fail to be of the greatest service to geologists in all parts of the world, if only it appears punctually. Messrs. Dulau and Co. act as London agents, and the subscription price is thirty shillings.

THE *Transactions* of the Leicester Literary and Philosophical Society (vol. v., part 10, October 1900) contains three excellent pictorial plates of the pre-Cambrian rocks of Charnwood Forest to illustrate an excursion conducted by Prof. W. W. Watts. The reports of other geological excursions are illustrated by remarkably clear maps and sections prepared by Mr. Fox-Strangways. There are also notes on the botany of the Beaumont Leys Sewage Farm, by Mr. A. B. Jackson, and an address to Section E (Zoology) by Mr. F. R. Rowley. Curiously enough, the entomologists form a section by themselves apart from the zoologists, who are urged by Mr. Rowley to take up the neglected groups of "Rhizopoda, Heliozoa, Infusoria, Turbellaria, Oligochaeta, Rotifera, Acarina and Polyzoa."

WE have received from the author, Dr. S. Kaestner, a copy of his inaugural address delivered at the Leipzig Academy on the methods of preparation employed in embryological investigation.

THE excellence of the illustrations forms a striking feature of the latest issue (vol. v. No. 2) of *Indian Museum Notes*. Mr. G. B. Buckton describes one new insect injurious to forest rees, and a second to betel; while the other contributors treat of many kinds of insect pests.

To the January number of the *Entomologist*, Dr. A. G. Butler contributes some highly interesting observations with regard to the seasonal phases of certain South African butterflies. For instance, the form described as *Precis simia* proves to be the wet season phase of *P. antilope*, and *P. trimeni* that of *P. cuama*. Since these phases are not absolutely confined to season, the indiscriminate use of the term "seasonal form" is deprecated.

ACCORDING to the *American Museum Journal* for November, active steps are being taken for the further zoological exploration of Alaska, Mr. A. J. Stone having already started on a preliminary collecting trip. There is, however, a proposal on foot to start an "Arctic Mammal Club," and it is hoped that the 2000 dollars left conditionally by the late Mr. Constable for the exploration of Alaska will be shortly available. The condition is that the amount should be raised to 5000 dollars by other contributors—and in a rich country like the United States there ought to be little difficulty in getting this sum subscribed.

To the *Proceedings* of the Washington Academy (vol. ii. pp. 661-676), Dr. Merriam contributes a preliminary revision of the red foxes of North America, of which no less than twelve species and races are recognised. The author regards all these forms as specifically distinct from the common fox of Europe and Northern Asia, although he states that the one described as *Vulpes alascensis* is closely related to the latter, which it connects with the more southern American types. To many zoologists this admission would indicate that all the American red foxes are nothing more than local phases of their Old World prototype. In another part of the same journal (pp. 631-649), Mr. G. S. Miller describes a collection of small mammals from Liberia, among which several are new.

WE have received Prof. Herdman's fourteenth annual *Report* of the Liverpool Marine Biological Committee, and their biological station at Port Erin (Isle of Man). The editor observes that although there is nothing remarkable to record in regard to the educational work of the station, yet all lines of research have been continued and all investigations advanced a stage, while several important publications have been issued. Detailed reports of the laboratory, aquarium and dredging operations are given, and seven plates are appended showing the distribution of the marine fauna at the south-western extremity of the Isle of Man and of particular groups of the same in Port Erin Bay. The preparation of these last must have entailed a vast amount of labour on the part of the staff.

AMONG several other papers, vol. xii., part 2, of the *Proceedings* of the Royal Society of Victoria contains a note by Mr. R. H. Walcott relating to the cast of a fossil tree-trunk in basalt. It was found at Footscray, and shown at the Melbourne Exhibition of 1866. Unlike ordinary fossil stems, in which the wood has been replaced, atom by atom, by mineral matter, the whole of the woody matter in the specimen in question was first destroyed, leaving a cavity which was subsequently filled by liquid trap. A necessary condition for the preservation of the tree-form at the time of the entombment of the specimen seems to have been its rapid inclusion in the molten rock, so that the carbonised remains would be inaccessible to the air, and maintain the mould in its proper shape until the trap had cooled sufficiently to prevent it from closing in. A subsequent flow filled the cavity. The author is of opinion that the specimen cannot be a concretion, and, if he is right, it appears to be unique.

MR. J. E. S. MOORE's account of his researches and explorations in Lake Tanganyika and the countries to the northward, published in the January number of the *Geographical Journal*, will be read with interest both by geologists and zoologists, as

well as by the members of the society before which it was presented. After relating the history of the discovery of the remarkable molluscan fauna of the great lake, and pointing out how it differs essentially in its marine *faunes* from that of all the other African lakes, the author refers to the Tanganyika jelly-fish, and concludes that the evidence in favour of the marine origin of the "halolimnic" fauna is overwhelming and irresistible. He then discusses the objections that have been raised against his theory on the ground that, according to an opinion advanced years ago by Sir R. Murchison, no part of the interior of Africa has ever been beneath the sea. This opinion was in part based upon the presumed absence of evidence of volcanic activity in Africa south of the equator. The discovery of volcanoes, both active and passive, in this area, as well as of huge lava-flows, discounts the latter part of the objection, while the evidence of the Tanganyika fauna itself is considered to outweigh the other part.

As regards the outlet by which Tanganyika (presumably as far back as Jurassic times) communicated with the ocean, Mr. Moore adduced evidence to show that, instead of being northwards by way of the other great lakes and the Nile valley, this must apparently have taken place by way of the Congo. The author, from the physical features of the country, was led to believe "that the lake had at some former time extended far to the west of its present site, in the neighbourhood of the Lukuga. It is only necessary for such extension to cover some eighty miles to bring it into communication with the great circular basin of the Congo itself." It is true that the evidence against the original northward extension of the lake is mainly of a negative nature, that is to say, the absence of the halolimnic fauna in the northern lakes; but, as Prof. Lankester observed, negative evidence "has its distinct importance and value as much as positive evidence, and we are in a position to say certainly that the marine fauna of which Mr. Moore has so fully established the existence in Tanganyika did not arise from a northward extension of the lake."

PART IV., completing vol. xxi., of the *Transactions* of the Botanical Society of Edinburgh, contains a second article by Mr. C. E. Hall on tree measurements, from which it would appear that in the tropics, as with us, the chief factor in the growth of trees is rain.

A NEW text-book of botany ("Cours de Botanique," published by Dupont, Paris) is announced, by Profs. Bonnier and Leclerc du Sablon, in two vols. (25 fr.), with upwards of 3000 illustrations, mostly drawn from nature. A new departure is claimed, in the item that the description and anatomy of the organs are taken from a certain number of type-species chosen from widely spread plants.

WE have received the Report of the Moss Exchange Club for the years 1899-1900. Associations of this kind are obviously useful in promoting an interest in their particular branch of science, and the study and determination of critical species. Their danger lies in the destruction of rare and local species, and we should have liked to have seen a hint to this effect in the Report. The honorary secretary of the club, to whom communications are to be addressed, is Mr. C. H. Waddell; but we do not find his address in the Report, which is printed at Stroud.

THE volume of *Knowledge* for 1900 contains numerous splendid collotype plates and other illustrations accompanying articles on subjects belonging to most branches of science.

DR. OLIVER LODGE'S presidential address on the controversy concerning Volta's Contact Force, delivered to the Physical Society at the annual general meeting in February last, is published, with other papers, in the December number of the *Proceedings* of the Society.

THE six monthly numbers of the *Geographical Journal*, from July to December 1900, make up volume xvi., which has just been published by the Royal Geographical Society. The volume contains 766 pages, as well as numerous coloured maps, and is full of matter of interest to the student of geography in all its aspects. Among the many important papers are Dr. C. Hose's account of the natives of Borneo, Captain Deasy's "Journeys in Central Asia," Mr. E. S. Grogan's "Through Africa from the Cape to Cairo," Prof. Haddon's "Studies in the Anthropogeography of British New Guinea," Mrs. Ogilvie Gordon's "Origin of Land-Forms through Crust Torsion," Mr. Borchgrevink's description of the *Southern Cross* Antarctic expedition, and Dr. Donaldson Smith's "Expedition between Lake Rudolf and the Nile." Most of the papers are accompanied by reproductions of photographs of the regions or peoples visited.

THE "Guide to the Babylonian and Assyrian Antiquities" in the British Museum, which has just been published, is a marvel of interest and cheapness, the price being only one shilling. The guide provides notes, interpretations, and thirty-four excellent plates, referring to Babylonian and Assyrian antiquities covering a period of about five thousand years, ranging from about B.C. 4500 to A.D. 500. "In them," Dr. Wallis Budge remarks in the preface, "are comprised by far the largest portion of available material for reconstructing the history of Western Asia, inscribed in the cuneiform character." Dr. Budge's numerous contributions to the science of antiquities have had a profound influence upon intellectual progress; and this new guide, though small in comparison with the works which stand as a monument to his vast knowledge of the past, give students an additional reason for being grateful to him. By the publication of the Guide the Trustees of the British Museum have rendered available a mass of information of interest to students and the public alike.

THE publication of a great work on systematic botany has been commenced by Mr. Englemann, of Leipzig (London: Williams and Norgate), under the title "Das Pflanzenreich." The work has been undertaken by Prof. A. Engler, and is to be a complete record of the plant kingdom. Particulars of the plan of the work, two fascicules of which have been received, are given in Messrs. Williams and Norgate's Book Circular for December. Every one of the 280 families is to form a monograph by itself, with a separate and complete index, the larger families each forming a separate fascicule. Each family begins with the enumeration of the literature, including monographs, which are restricted to genera, provided they deal with general morphological points, while the purely systematic treatises on genera are quoted with the latter. To each family is attached a complete list of its groups, genera and species, with the generic and specific synonyms. The work is amply illustrated by original drawings, with especial reference to the generic and sectional characters of the plants. This gigantic undertaking will, of course, require many years for its completion; but this is guaranteed, to a great extent, by subventions from the Prussian Government and the Imperial Academy of Sciences. The editor is anxious that it should be known that the present "Pflanzenreich" is not a second edition of the "Natürliche Pflanzenfamilien," supplements to which will continue to be published every few years.

THE much-debated question of the existence of an ammonium amalgam would appear to be finally settled in the affirmative as the result of recent researches. The fact that the volumes of ammonia and hydrogen evolved from ammonium amalgam are in the ratio of 2:1 has been regarded as evidence in favour of Berzelius' ammonium theory, but the inability of ammonium amalgam to effect the reduction of the heavy metals from their salt solutions, in opposition to potassium and sodium amalgam,



spoke strongly against the theory. The investigation of the electrolytic tension of decomposition of the ammonium salts with a mercury cathode, by Coehn and Dannenberg (*Zeitschrift für anorganische Chemie*, 25, 430), has given results perfectly analogous to those obtained with salts of the alkali metals, a result only explicable on the assumption of the ammonium theory. Experiments carried out under varying conditions to ascertain the possibility of reducing the heavy metals from their solutions, show that the negative results previously obtained are due to the great instability of the ammonium amalgam. By preparing the amalgam electrolytically at low temperatures ( $0^{\circ}\text{C}.$ ), when it appears to be much more stable and does not exhibit, to any great extent, the spongy appearance peculiar to the amalgam prepared under ordinary conditions, and allowing it to act on cold solutions of copper, cadmium and zinc salts, the formation of the corresponding heavy metal amalgams is easily observed. In the case of the copper, it might be possible to explain the reduction by attributing it to the nascent hydrogen generated in the decomposition of the ammonium amalgam; but this explanation is not possible in the case of the cadmium and zinc salts.

THE additions to the Zoological Society's Gardens during the past week include a Bonnet Monkey (*Macacus sinicus*) from India, presented by Mr. R. F. Wilson; a Polecat (*Mustela putorius*), British, presented by Mr. Hett; three Painted Snipe (*Rhyngchaea capensis*) from India, presented by the Hon. Walter Rothschild, M.P.; a Tawny Owl (*Syrnium aluco*), European, presented by Mr. F. Medcalf; a Deville's Tamarin (*Midas devillii*) from Peru, a — Conure (*Conurus ocularis*), an Orange-winged Amazon (*Chrysotis amazonica*), a Brazilian Tortoise (*Testudo tabulata*) from South America, three Japanese Pheasants (*Phasianus versicolor*) from Japan, two Pennant's Parakeets (*Platyercus elegans*), a King Parrot (*Aprosmictus cyanopygius*) from Australia, deposited.

#### OUR ASTRONOMICAL COLUMN.

ORIGIN OF TERRESTRIAL MAGNETISM.—The *Observatory* for January contains a translation by Prof. L. A. Bauer, of the U.S. Geodetic Service, of an article in *Ciel et Terre*, December 16, 1900, containing the results obtained by Dr. Schmidt from an important harmonic analysis of the permanent magnetic field of the earth. This work has been practically an amplification of Gauss' "Théorie générale du magnétisme terrestre."

In Schmidt's analysis he does not assume the existence of an interior potential function governing the entire magnetic force; but adjusting separately each of the three rectangular components, obtains three expressions in place of the one determined by Gauss; moreover, the computations have been carried to the terms of sixth order instead of the fourth. He concludes that the magnetic force of the earth consists of three parts:—

(1) *The greatest part*, attributed to causes situated in the terrestrial crust, and having a potential.

(2) *The smallest part* (about one-fortieth the whole), due to causes exterior to the crust, and also possessing a potential.

(3) A part, somewhat greater than (2), not represented by a potential, and therefore indicating the existence of vertical terrestrial electric currents.

Dr. Schmidt has also made careful examinations of the records of magnetic storms. In that of February 28, 1896, which was observed at fifteen observatories, and lasted from 6-7 o'clock, he finds that the directions of disturbance vary considerably, at times converging to a point, at others radiating from a point; while at certain periods of comparative calm the lines of force were practically parallel, suggesting a distant centre of force. Taking these facts in consideration with the vertical component disturbances, he concludes that the causes producing terrestrial magnetic storms are for the most part exterior to the surface of the earth.

OPPOSITION OF MARS IN 1888.—Signor G. V. Schiaparelli has recently published a sixth volume of observations of Mars, containing the discussion of his determinations on the topo-

graphy and constitution of the planet during the opposition of 1888, made with the 18-inch Meiz refractor at the Milan Observatory. After preliminary notes of instrumental details and tables showing varying size of the disc, atmospheric quality, &c., about eighty pages are devoted to the detailed description of the aspects of the many markings recognised during the period, very many comparisons with the work of other observers being included; the remainder of the volume is occupied with the discussion of observations bearing on the constitution of the surface, giving detailed measures and descriptions of the varying polar caps, and a comparative analysis of the gemination of the principal "canali." Reproductions of drawings of the surface markings on successive dates are included, and two polar charts showing the whole of the observed phenomena in their relative longitudes.

DOUBLE STAR MEASURES.—In the *Astronomische Nachrichten* (Bd. 154, No. 3679) Mr. J. Comas Sola gives a series of measures of seventy-five double stars observed at Barcelona.

#### SCIENTIFIC DEVELOPMENTS OF BIOLOGY AND MEDICINE.

AN interesting monograph is just to hand in the shape of a lecture, delivered by Dr. Oscar Hertwig upon the occasion of the congress of German naturalists at Aix la Chapelle (Aachen). The subject is the development of biology in the nineteenth century. Many interesting points, forming landmarks in the progress of biological science, are discussed by the lecturer. The microscope, from the inestimable service it has rendered to morphology, must rank high in the discoveries of the century. Before morphological method had been enriched by it, the cellular hypothesis, which is the foundation stone of all biology, was impossible. Dr. Hertwig accentuates the fact that progress consists, not only in adding facts to our treasury of knowledge, but also in stamping out error, and that some of the biological energy of the nineteenth century has been consumed in annihilating the doctrine of spontaneous generation; it was, indeed, only Pasteur's researches that established irrefutably the dictum *Omne vivum e vivo*, and much later still did the corollary of this, namely *Omnis cellula e cellula*, firmly plant itself upon biology, never to be uprooted.

A further factor of transcendental importance in the progress of biology during the nineteenth century was the birth and growth of the study of embryology. Its chief result was the theory of evolution and the accompanying doctrines of natural selection and the survival of the fittest. The lecturer enters fully into the literature of this subject, which has moved the biological world perhaps more than any preceding one. The concluding part of the discourse is devoted to the progress made in that department of biology which we know as physiology. The attempt in this direction during the latter part of the century has been to reduce, by means of physico-chemical technique, biological phenomena to physico-chemical law. This attempt, although it has given us an enormous insight into the processes of life and has enabled us to formulate laws of the highest abstract and utilitarian value, has been, in its absolute sense, unsuccessful. It is doubtful if chemical and physical law can ever explain fully the phenomena of life, and while physiological chemistry and physics have destroyed the old vitalism, we are, to some extent, compelled to take refuge in a new one. From the practical standpoint, great progress has been made in the development of pharmacology and experimental pathology. The former, going hand in hand, as it ever must, with the practical treatment of disease, has not only thrown light upon many problems of pathology and physiology, but has greatly increased the possibilities of therapeutics, and given distinct hope for the future in this direction. Under experimental pathology serum therapy is included, and the immense field for research this has opened up.

An address delivered by Dr. Naunyn, of Strassburg, at the same congress, is of considerable interest. He chose for his subject the development of medicine, hygiene and bacteriology during the nineteenth century. To show the condition of medical thought at the beginning of the century, he quotes from the work of Prof. Kieser, of Jena, in 1812. At that time the exanthemata were regarded as necessary stages in the growth of mankind, and as essential to his perfect development, just as the pupa stage is essential to the butterfly. The scientific development of medicine, according to Prof. Naunyn, took its first real